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Based on a review of the successes and failures experiences by industry in integrating computers into management information systems, the author provided some suggestions for more successful computer utilization by junior college administrators in solving increasing administrative problems. Factors related to the successful use of computers in industry and having relevance for colleges included: extensive executive involvement; a positive environment for change created by the chief executive; the application of computer systems to a broad range of problems; and an adequate staff to support the system. Factors inhibiting success in both industry and education included: duplication of existing manual systems rather than analyzing total information needs; an underestimation of computer costs by the chief executive; and a lack of awareness, and therefore a sympathy, among personnel for total organization needs. The success of computer systems at junior colleges depends upon administrators: actively participating in the creation and development of the system; realistically appraising the cost of the system, including the computer itself and supporting staff; and critically assessing the benefit in terms of expenditure. To meet these tasks there is a pressing need for college administrators to develop a stronger understanding and appreciation of computers, their costs, capabilities, and potentials. (MB)

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CREATING AUTOMATED INFORMATION SYSTEMS FOR A JUNIOR COLLEGE: IMPLICATIONS FOR TOP LEVEL ADMINISTRATORS

A Paper

Presented to

Dr. Ralph Prator

Graduate School of Education

University of California, Los Angeles

In Partial Fulfillment

of the Requirement for Education 441-D

Junior College Administration

JC 690 237

by

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December 1968

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I. INTRODUCTION

There are several severe problems of college administration which might be elevated by computers and automated information systems. These problems (as discussed in our first seminar meeting) are:

1. The magnitude and complexity of the top administrative task.
2. The enormous data housekeeping task.
3. An increasing rate of change in college operations.
4. Important decisions made on the basis of a small amount of data.

For many years leaders in industry have continuously faced these same problems. With the advent of the computer, industrial leaders hoped to integrate this new tool in a management information and control system. This paper will investigate the degree of success and more importantly any problem business has encountered, or is encountering, in development.

One of the main purposes for installation of a computer in a college is to furnish educational administrators with pertinent data to make better decisions. The desired end result of any information system is ". . . to insure that key decisions are, in fact, congruous with the objectives of the organization" (20:15). Although great strides in education's automated information systems are beginning to be made, not everyone has been happy with results so far. This paper will investigate some of the reasons for disappointing results and come to some conclusion as to how top level administrators in the junior college can better utilize the computer in the solution of increasing administrative problems.

The specific objectives of this seminar paper will be to:

1. Define the concept of information systems in industry.

2. Determine by a literature review some current management problems in industrial development of an information system.

3. Describe some current efforts in creating information systems in education.

4. Determine some guidelines for junior college administrators in setting up an automated information system; what the expectations of the system might be; and what the cost might be.

II. INFORMATION SYSTEMS IN BUSINESS

In industry there is a radical shift away from the intuitive or "seat of the pants" approach to organization, control, and decision making. Concepts of the system approach such as defined objectives, standard levels of achievement, and constant evaluation of achievement used as feedback are accepted as necessary for a corporation to survive. These concepts are also foundations for the Total Information Systems that businesses see as possible when the full benefit of the computer is realized and the business activity and environment is defined (24,28).

Today corporations view their divisions or departments as a series of separate information networks connecting the requirements for information in each decision-making process with the sources of data and extending throughout all of their business process. Each separate part of the total network is a separate information system comprised of a planned method of collecting data and converting it to useable summaries to be passed on in the system. The specific activities necessary to create most information systems are (1) information determination, (2) information collection, (3) information processing, (4) information analysis, (5) information transmission, and (6) information interpretation (31:4). The promise of the computer is to aid in these activities.

The idea of viewing a business organization as a network of information systems has been expounded by teachers of management for many years. But only within the last ten years has there been available the methods, tools, techniques, and data processing

equipment to even attempt a total information system approach to an organization's data needs.

This Total Information System approach is not an automatic solution to management decision making and planning by computers or robots. It is, rather, a management-oriented system conceived and designed by management as a single, total entity to control the entire organization. Individual applications are designed and programmed to meet the needs of a restricted area of the organization, but with the needs of the whole organization in mind. When this approach is taken, it is surprising to see the interconnections of separate information systems which were thought to be entities in themselves but are really connected by a common flow of data and a larger common objective (24:Chapter 4).

In a total automated information system all pertinent data would be caught up at its source, screened, classified and stored, and automatically forwarded to those who could use it. Any user could obtain any information at anytime. Although no real total systems have materialized, parts of total systems exits; and much has been learned by industry from the application of computers to these subsystems. The educational administrator can perhaps learn what data processing pitfalls to avoid by investigating industry's experience in automating information systems. A purpose of this seminar paper is to research these industrial findings concerning computerization for information needs.

III. FACTORS AFFECTING THE SUCCESS OF MANAGEMENT INFORMATION SYSTEMS

There are many outstanding examples of successful computerization of information systems that could be noted in the management literature. However, the intent of this paper is not to describe industrial successes but rather to note the problems and factors which affected the automation of an information system.

Industry experience with electronic data processing to date has often indicated these discouraging facts:

1. Clerical cost savings rarely materialized from computer equipment application.
2. Any significant savings realized could largely be identified with improved systems work proceeding or in conjunction with mechanization.
3. Faster report production (more paper) often did not provide more valuable management information; it increased the problem of management scanning more data to determine significant data. (7:16)

Industry research often was undertaken to determine the reasons for the discouraging results. A study by McKinsey and Company, Inc., analyzed the operations and organization of twenty-seven companies from thirteen industries to determine how and why some companies were able to recover computer start up and operating costs while others were not able to do so. The twenty-seven companies studied were large, established users of business computer equipment. They all began computer system development by 1958 and at that time they represented fifteen percent of computer installations in United States industrial and merchandising companies. After six years of computer operations only nine of the twenty-seven companies had recovered start up and operating costs. Not

only did these nine companies recover start up and operating costs, but they also showed an average annual return of $1.30 per $1.00 invested in computer systems (16).

Three factors were noted in the report as being significant. The nine successful firms spent an average of ten percent of capital expenditures on computer systems while the other eighteen firms spent an average of three percent. The organizational level of the corporate computer executive for the nine top companies was significantly higher than the remaining eighteen companies as shown in Figure 1, page 7. And, finally, the nine top firms typically applied their computer systems to a broad range of key problems and applications (16).

Arnold Putman, president of the Rath and Strong Management Consulting Firm, showed a disadvantage of the common approach of mechanizing existing manual procedures rather than analyzing the total information needs of the organization.

> A number of companies have automated function by function resulting in 3 to 10 times as much keypunching and computer processing required as in an integrated system. (32:42)

In this article as well as many other researched articles, executive involvement is noted as being of utmost importance when installing a automated information system.

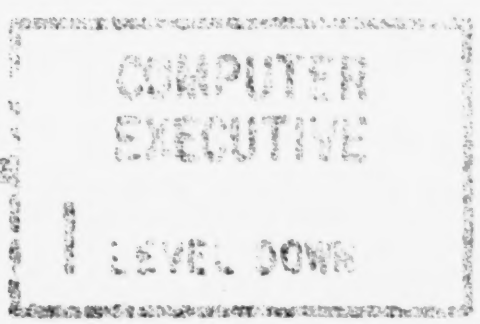
> Nothing can replace direct involvement of the chief operating executive, particularly in finding out whether the coordination he insists upon at the top is getting through to the bottom. People up and down the line read much into such executive interest:
> (a) The project must be important.
> (b) If it is not going correctly, the man who can change it knows.
> (c) It's all right to change methods even at the risk of some mistakes. (32:47)

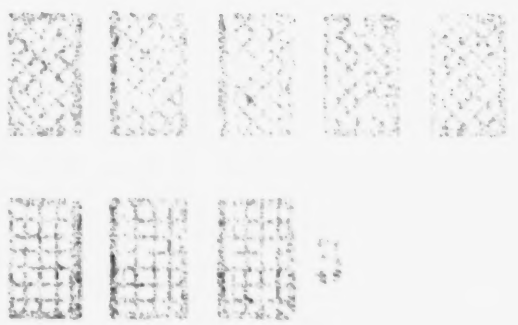
Experience in industry has shown that it is folly to assume

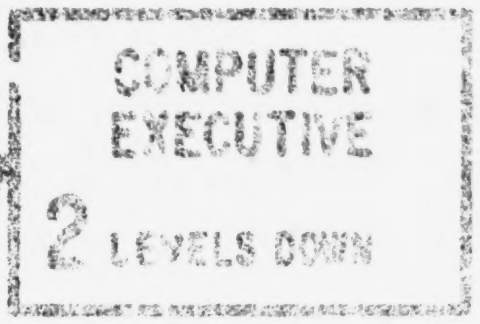
ORGANIZATIONAL LEVEL

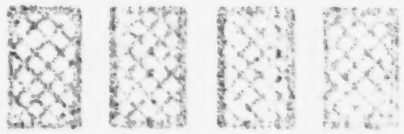
of the CORPORATE COMPUTER EXECUTIVE

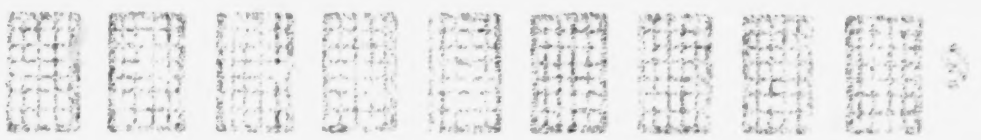
McKinsey & Co. Inc.

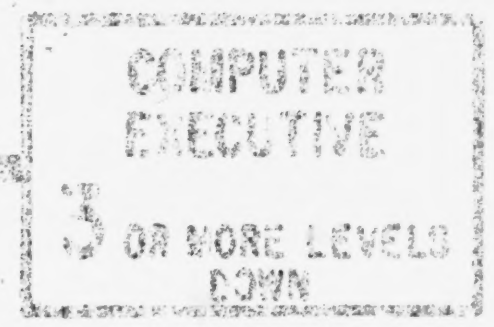


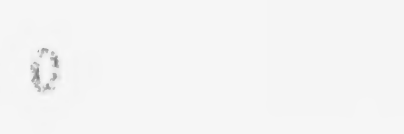


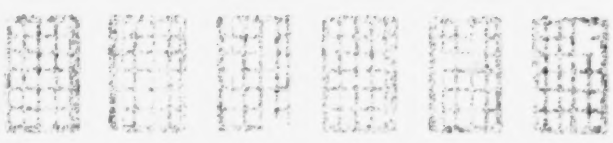












that personnel of the strong line functions of a business have a natural tendency to cooperate in the automating of an information system. In the routine conduct of business, habit performance patterns are easily developed. But because a successful automated information system involves the total information needs of the organization, habit performance patterns of many individuals throughout the corporation often require modification. During this time of change in an employee's routine, many questions and insecurities arise:

1. Personally, will I be better off with the success or failure of the change?
2. Shouldn't my greatest loyalty be to my own function?
3. Shouldn't I get credit for all or part of a modified new proposal?
4. Would my stature look better if that of the others looks worse?
5. In this time of change, shouldn't I get a bigger job?
6. Why should I do the extra work when the new and the old systems run in parallel?
7. If I keep the old system accurately, won't the new look less attractive?
8. If new information highlights problems that I know exist so that they become visible to management. (32:42)

Because attitude of the user is such a key factor in the success of an automated information system, the chief executive must create a positive environment for change. This means actively understanding the process of successful change, an analysis of the particular situation to see where it fails to meet the requirements, and taking specific action to overcome the problems (32:44).

The Diebold Group, Inc. found that thirty percent of 2700 corporations survived reported that top management is not

responsible for guiding and directing very closely the growth of automated data processing within the organization (1:7). A ranking of the sources for recommendations for future applications of data processing is presented below:

Percentage of Response*	Source
52	Data Processing Management
31	Line Management
27	Top Management
9	Management Science Advisors
4	All other sources

*More than one source sometimes indicated (1:8)

The Diebold research group indicated in their report that this was a serious defect in the policy of top management toward automated data processing:

> Growth is too often guided by those whose skills are in implementing applications rather than in determining the rationale or need for a particular application. We also found that in specific corporate situations, where a rather original application could have been of great value, it was never implemented because recommendations originated with data processing management unfamiliar and perhaps uninterested in the total corporation need. (1:8)

Management literature suggests that comparative economic characteristics of computers and automated information systems are not widely known by top level management.

> While other investment decisions, which fall more into the realm of management's knowledge, are deliberated in great detail, investment decisions regarding computers are often determined by a clever salesman of a computer manufacturer, by an inflamatory article in a management journal, or by practices of a competitor (who may have spent just as little time in systematic deliberation on the issue). (34:61)

The Diebolt Group researched the distribution of total automated data processing investments among three broad catagories of expenditures. The explanation of these catagories and the percent range of investment is presented on the next page:

1. Machine rental or purchase 40-50%
2. Operations (i.e., material, supplies, program maintenance, computer operating staff) 30-40%
3. Systems (systems planning, systems analysis, and programming for future applications (1:16) 20-30%

A distribution of total annual data processing budgets is presented on page 11.

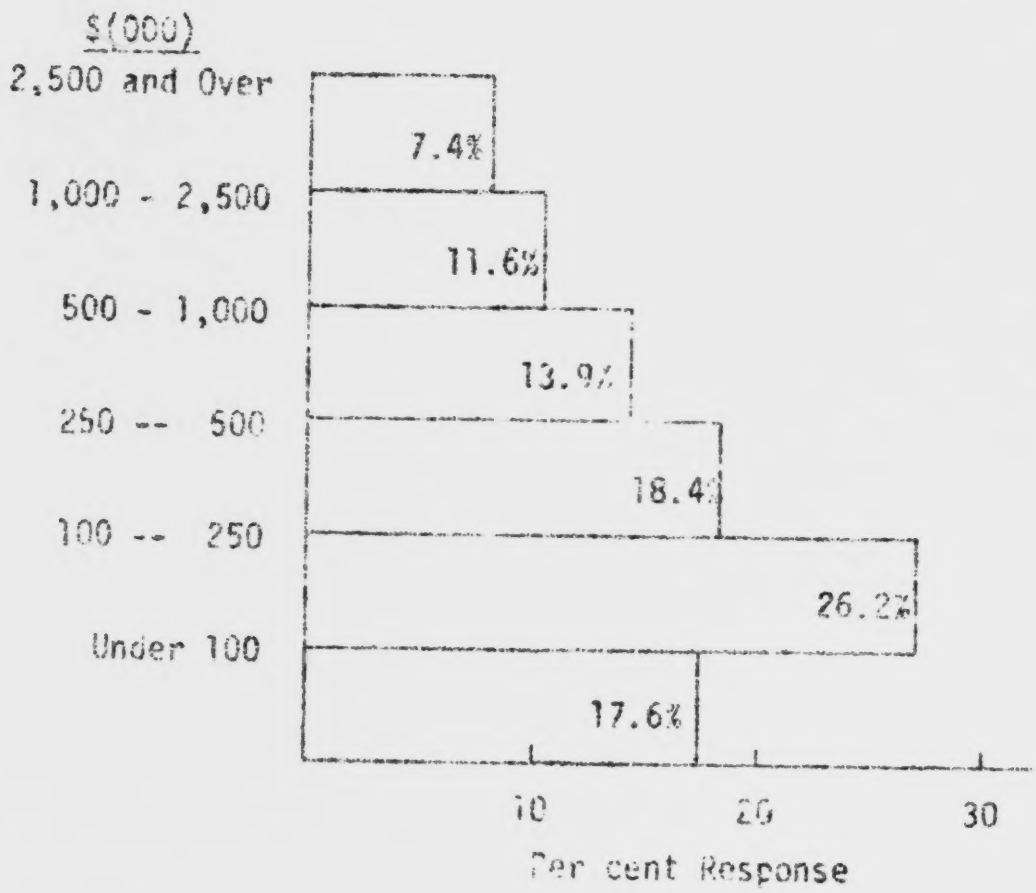
A similar budget profile of data processing users can be seen by determining the number of computer installations by monthly rental figures:

Monthly Rental	Number of Installations	
$ -- -$ 5,000	20,586	
$ 5,000-$10,000	15,036	
$10,000-$20,000	5,548	
$20,000-$40,000	1,543	
$40,000-$60,000	406	
$60,000-$80,000	359	
Over $80,000	34	(34:69)

Based upon these budget profiles most junior colleges are on the low end of the dollar expenditure scale. Some pertinent industry research has shown that generally, smaller data processing users appear to be much less realistic in their future planning of expenditures than are the larger users. It has been found that these smaller users greatly underestimate what their expenditures will be (24:Appendix A).

The writer feels that the danger of underestimated electronic data processing expenditures is a problem that a junior college administrator must aggressively combat. The problem is partially solved by a knowledge of automated data processing costs. In addition, industrial research further implies that the thoroughness and appropriateness of the initial automated information system

PROFILE OF RESPONDING ORGANIZATIONS BY TOTAL ANNUAL ADP BUDGET



Total Respondents = 2,700

Total No Response = 83

will in the long run result in a lower expenditure. Finally, a competent data processing staff coupled with extensive top management participation in technical development has been found to be an exceedingly important factor in the establishing of automated information systems.

IV. AUTOMATED INFORMATION SYSTEMS IN EDUCATION

Even though education represents the epitome of information activity, it is lagging behind other sectors of the economy in the use of electronic data processing technology. Dr. DeRodeff, past president of the California Educational Data Processing Association, suggests that the problem stems from a lack of top administrative involvement.

> The reason for education's lag in electronic data processing is not inherent in the traditional explanation of a "budget deficiency," and appears to exist in the lack of high level administrative commitment. EDP, by virtue of its centralized and pervasive services, cannot be assumed under the traditional line and staff organization as it now exists in many instances. (19:123-124)

To date, most educational applications tend to duplicate manual systems and do not reflect the potential of computers in total information systems. The concept of total information is enthusiastically discussed and defined in educational literature:

> In the total information system concept, the confluence of all information flow is the electronic data processing center which provides an active communication network for the entire educational organization. (19:124)

But rather than providing an information network for the "whole" college, often new computer technology has been absorbed within an existing administrative unit. Among the major weaknesses of this traditional approach in education are:

1. The duplication of effort required by those furnishing the necessary raw data.

2. Unmanageable collections of paper work in each administrative area resulting in the preparation of management reports so out of date that they provide little help to the decision makers.

3. Personnel in one division usually have little if any knowledge of the information needs of any of the other divisions and no one has an adequate conception of the

overall information needs of the organization. (19:2)

Various administrative applications of the computer have been reported in the literature. The most common applications have been to various purchasing, accounting, recording, grading, scheduling, and planning reports. A relative ranking of educational applications of computers was studied by the California Association of Public School Officials. The study group found enrollment and grade reporting to be the most common computer application. These two applications were followed by class rosters, semester grades, names and addresses, report cards, grade distributions, failure lists, student locator cards, course tallies, attendance, temporary student schedules, standarized testing and class test scoring (5:4.1).

For comparison purposes, presented below is a partial list of automation applications in industry. These are the ten most common applications and are presented in rank order:

1. Payroll
2. Accounts Receivable
3. Billing
4. Sales: Statistical Analysis
5. General Accounting
6. Time Sharing
7. Research
8. Inventory Control
9. Expense Accounting
10. Cost Accounting (17)

The applications appear quite dissimilar in education and industry. However, reflection on the educational applications indicates that a type of educational billing is done in enrollment and grade reporting. Also, quite naturally, statistical analysis of educational output is widely undertaken.

The heavy emphasis on the traditional accounting applications

is apparent in the industry list and noticeably absent in the educational list. Speculation on the appropriateness of priorities might be discussed at this point; but this is an area that individual top administrators must decide at each school.

When the Diebolt research group examined initial reasons for installing information processing equipment in business, seventy-eight percent of all respondents indicated that the initial reason was to realize savings in operating or administrative costs. More importantly, sixty-seven percent of the smaller firms take this viewpoint as opposed to ninety-three percent of the larger organizations. More timely market information and improvement in high level decision making is a popular reason with twenty-nine percent of the respondents in the smaller budget group, while only eighteen percent of the largest budget group indicated that this was an original and valid basis for installation (1:16).

Dr. Anderson, president of the Association for Educational Data System, suggests that many schools have "big computer expectations for small computer investment." This is true of many small-budgeted computer installations which seem to have more widely diverse initial intentions with less emphasis on straight cost-justification. The Diebolt research group after conducting intensive interviews in corporations made the following pertinent observation:

> . . . larger corporations were considerably more realistic in their expectations of what information processing applications were really designed to do. There is some indication that smaller organizations citing "decision-making" as an original reason for installation, were simply less cognizant of the magnitude of such an intention. (1:17)

Taking a total information approach and a medium sized computer, some schools have been able to fulfill some combination of the following objectives:

1. Relieving instructors of clerical tasks related to the preparation of student records and the scoring of objective tests so that more time can be allotted to giving individual student assistance.

2. Assisting counselors to program students through the use of grouping techniques and automatic scheduling, thereby permitting more time for student counseling.

3. Providing instructors and students with access to EDP equipment as part of the curriculum devoted to vocational training and the demonstration of a new body of knowledge--applied computer science--related to math, physical science, social science, and business administration. Computer-assisted instruction (programed learning) may someday exceed record production as a function of automated data processing.

4. Preparing personnel records and accounting applications for the business office.

5. Completing a statistical analysis of student census data and budget projections for the superintendent or president and the board of education.

6. Maintaining permanent student record information for the district pupil personnel office or registrar.

7. Providing statistical data used for curriculum research and evaluation.

8. Preparing reports for the documentation of myriad federally funded projects. (19:125)

The important point in relation to the above list is that although the computer is a powerful tool for problem solving, it doesn't solve problems by itself. It takes human knowledge and understanding to set up a problem or procedure to the point where a computer may be useful, and to interpret and use the output of the system.

The real bottleneck is staff understanding of what can be

> done and how. If this isn't solved, the future promise of EDP will remain just that. (2:106)

Many computer programs and systems can be formalized, understood, and demonstrated in the educational institution; often, however, the program is demonstrable only because of one key person and often this key person is spread awfully thin for the total work to be done. For this reason something may work in a technical sense but the development of staff procedures and understanding may still be a long way off. A computer system without an adequate staff is somewhat of a wasted expenditure (2:106).

Because of recent developments in computer equipment, junior colleges have an option as to the type of computer system organization it will employ:

> Many of the most recent developments in computer technology have been directed toward reducing the price of computing power, to make available to smaller users the services and capabilities that previously were economically available only to large users. The primary form which this effort has taken has been to achieve a functional fragmentation of larger systems to permit their capability to be shared by large numbers of individual users. (5:2.1)

The traditional organization of junior college computer systems has been individual unrelated computer facilities for each junior college. The primary advantages of each junior college having its own local computer installation include:

1. Individual control of data base and design of output products.
2. Ability to establish and vary priorities.
3. No or minimal needs for communication links. (5:3.1)

The Southern California Junior College Advisory Council, recognizing the capabilities of forthcoming hardware (computers) and software (programs), has recommended the establishment of regional

centers, formed and operated by a group of cooperating junior colleges who would jointly share a large computer system. The proposed advantages of a regional computer center included:

1. Increased system capabilities available from larger equipment (larger data base, greater flexibility, reliability, and over-all performance).
2. Increased standardization.
3. Comparative information available among colleges.
4. Lower cost for equipment operation and maintenance. (5:3.1)

This writer feels that the idea of cooperative regional centers each sharing a large remote computer is an outstanding idea. All industry signs indicate a great increase in the use of large shared computers in the future. It is interesting to note that the most recent articles on computer "time sharing" indicate that the combination of small individual computers and a large shared computer may well prove to be the economically optimal solution (34:70). Computer technology is at a stage now where a small stand-alone computer can be tied into a large shared computer. This capability would seem to encompass the advantages of a local computing center and a larger regional center.

Crucial problems exist which will tend to cause the establishment of regional computer networks to be a slow process. Dr. Anderson indicates two of these problems:

1. Political problems, such as who controls the facility and who has what priority for its use.
2. Re-education of educators to create and use data with the new facility. (4:23)

Not only will the inter school problems have to be resolved, but top level management must become involved in the establishment of

automated information systems in the junior college. A reasonable prerequisite to this involvement would be a knowledge of what expectations of the information system are reasonable. These goals would then be weighed against realistic system's costs. The final section of this paper will discuss these goals and costs.

V. BENEFITS AND COSTS OF AUTOMATED INFORMATION SYSTEMS IN EDUCATION

This seminar paper has attempted to show that top management participation in the creation of an automated information system is an important factor of success. This participation should take the form of leadership in the careful planning of objectives and ways to reach these objectives. One of the most important areas for top management participation is in the continuing assessment of benefit versus cost. Unfortunately, this area of assessment requires the most technical knowledge and is, therefore, one of the usually avoided activities by top level administrators in education. The benefits of an information system were discussed in the previous section; now what about costs.

An analysis of the most common computers installed in California junior colleges is presented below in order to illustrate costs. Manufacturer, model, and average monthly price (exclusive of educational discount) is included:

IBM	1401	$ 6,480	
IBM	1440	4,300	
IBM	1620	3,000	
IBM	360/20	3,000	
IBM	360/30	9,340	
IBM	360/40	19,550	
Honeywell	H-200	8,400	(12:72-73, 6:31)

A data processing weekly publication called COMPUTERWORLD recently published a survey of operating costs (salaries paid) compared to computer rental costs. A summarization of this analysis is called Table A and is reproduced on page 21. The writer found no such analysis made separately for educational institutions.

Table A: REGIONAL COMPARISON OF TOTAL VALUE OF SALARIES PAID TO DATA PROCESSING PERSONNEL WITH TOTAL WEEKLY RENTAL COST FOR INSTALLED COMPUTER EQUIPMENT

(all figures in $ thousands)

	New England	Middle Atlantic	South Atlantic	E. North Central	W. North Central	E. South Central	W. South Central	Mountain States	Pacific States	National Total
Mgr. Data Processing	$ 371	$ 964	$ 531	$1065	$ 391	$ 186	$ 388	$ 174	$ 631	$4701
Asst. Mgr. Data Processing	164	297	178	454	141	44	76	25	353	1732
Mgr. Systems Analysis	300	740	415	778	243	126	252	133	494	3481
Senior Systems Analyst	1229	3054	1494	2715	810	378	818	387	2016	12901
Mgr. Computer Programming	276	713	364	700	247	112	248	133	504	3297
Sr. Computer Programmer	370	1038	528	1008	336	156	385	179	869	4869
Computer Programmer	495	1330	694	1316	450	214	479	238	911	6127
Coder	400	1004	594	1071	372	181	363	184	721	4890
Supervisor Computer Operations	205	605	314	652	208	97	208	98	393	2780
Computer Operator	519	1680	875	1680	551	240	587	274	1166	7572
Tab and Peripheral Equip. Supervisor	110	351	228	459	126	56	123	64	222	1739
Tape Librarian	92	235	107	224	74	36	88	42	232	1130
Total	4531	12011	6322	12122	3949	1826	4015	1931	8512	55,219
Approximate Weekly Rental Cost of Computer Equipment Installed	4,326	11,588	6,250	14,523	3,365	1,973	3,847	2,105	9,235	57,212
Ratio of Weekly Salaries of DP Personnel to Weekly Rental Cost of Computers	1.05	1.04	1.01	0.83	1.17	0.92	1.04	0.92	0.92	0.96

Certainly, this would be useful research for it would enable a comparison to national averages.

Nevertheless, using the average industrial ratio of data processing salaries to computer rental costs for the Pacific States, an estimate of total data processing costs can be projected by multiplying a junior college's computer rental cost by a ratio of .92 and adding this amount to the rental cost itself. Since several junior colleges familiar to the writer have considered leasing IBM 360/30 computers, this computer will be used for illustrative purposes.

$9,340	Average monthly rental of an IBM 360/30 computer
+ $8,592	Computer rental x salary ratio of .92
$ 17,932	Average monthly expenditure for computer rental and supporting salaries.
x 12	Months
$215,184	Average yearly expenditure for computer rental and salaries
+ $9,000	Miscellaneous operating costs (based upon the Diebolt, Inc. findings on percentages of expenditures--computer being fifty percent)
$224,184	Total average expenditures

When using the smaller Diebolt figure of forty percent of the automation expenditures for equipment, the average total yearly expenditure would be over a quarter of a million dollars per year.

It is important to remember that the stated figures are average figures. Research cited in this paper has indicated that those companies committing an above average capital expenditure for automation have shown a greater dollar return on investment. Because a realistic amount of money is budgeted for an automated information system, obviously doesn't mean that a junior college is guaranteed to recover its costs. However, along with realistic

objectives and a competent staff, the outlook for greater future benefit versus cost is outstanding.

The writer found the COMPUTERWORLD analysis of salaries to computer rental costs useful in another way; when the salary expenditures were used to imply a profile of an average organization on the Pacific Coast:

Title	Percentage of the Salary Costs
Mgr. Data Processing	08%
Asst. Mgr. Data Processing	04%
Mgr. Systems Analysis	06%
Senior Systems Analysis	23%
Mgr. Computer Programming	06%
Sr. Computer Programmer	10%
Computer Programmer	11%
Coder	08%
Supervisor Computer Operations	04%
Computer Operator	14%
Tab & Peripheral Equipment Supervisor	03%
Tape Librarian	03%

It is recommended that top level college administrators analyze their present data processing equipment cost in relation to the total salaries paid to data processing personnel filling responsibilities of the job classifications listed above. If the ratio of people to machine cost is relatively low, even a highly competent staff may be spread so thin that an effective automated information system is difficult to establish and even harder to promulgate.

This research of industrial information system costs hopefully has given educators a guideline as to what to expect in terms of personnel and equipment costs. Much study is required to further determine an actual data processing cost breakdown in

junior college information systems. Personnel costs might also include salaries of instructors involved in using the computer in their teaching. These salary costs, however, are not traditionally included in a cost analysis of a management information system and for that reason have not been considered in the writer's analysis. Research of actual benefit-cost relationships is very much needed in the area of junior college information systems. The writer hopes to further investigate this problem in future research.

In order for top level administrators to participate in the setting of realistic objectives for a junior college information system, it seems necessary to develop a stronger understanding and appreciation of computers and computer applications. Most top level educators are confronted with the fact that their professional training predates the computer revolution. Even many younger college administrators have not been exposed to data processing training, because data processing has only been recently included in college curriculums. John Flynn writes, "Most educators know at best of computers and not about them." (15:25)

Arthur B. Kahn in a recent article indicated that corporation executives and policy makers are often being provided with computer appreciation courses. These courses do not propose to make computer experts or programmers out of executives, rather the intent is to provide an understanding of computer applications and potentialities, as well as, development of sufficient skills to facilitate communication with computer experts (15:26). A

similar course is needed for many junior college administrators. Some computer manufacturers have attempted to provide such courses for educators. The problem, however, is often a computer expert aware of the computer's potentialities and unaware of the educational problems.

Because many California junior colleges have had several years experience with data processing equipment and several of these junior colleges have employed data processing directors, the writer believes that, today, educational administrators have a clearer idea of what they hope to accomplish with data processing equipment. Data processing directors also have strong opinions as to the computer knowledge that would be useful to a top level administrator. The perceived role of the educational leader in the establishment of an automated information system is another topic the writer hopes to pursue in future research. Knowledge of the perceived role by the computer expert and by the administrator should provide a basis for a computer appreciation course which would include specific information about best utilizing data processing facilities for specific junior college educational problems.

The intent of this paper has been to provide some specific information about automated information systems particularly costs and the less often publicized problems of development. The problem of the top level administrator participating in the selection of realistic objectives for an automated information system can only be solved by more computer education. And as long as educators feel impelled to delegate the responsibility of setting new

objectives for information systems, many meaningful innovative approaches to educational tasks and problems will be delayed or even worse, never attempted. It is much easier and more efficient time wise for the educator to learn about computer cost, capabilities, and potentials than it is for the computer expert to learn about education. Will the administrator accept the challenge?

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